**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

**In re application of: Jean L. Calvignac, et al.**

**Serial No.:** **10/015,165**

**Filed:** **December 12, 2001**

**For:** **HYBRID SEARCH MEMORY FOR NETWORK PROCESSOR AND COMPUTER SYSTEMS**

**Group Art Unit:** **2164**

**Examiner:** **Chojnacki, Mellissa M.**

**RESPONSE TO NOTIFICATION OF NON-COMPLIANT APPEAL BRIEF**

**Commissioner for Patents**
**P.O. Box 1450**
**Alexandria, VA 22313-1450**

**Sir:**

In response to the Notice of Non-Compliant Appeal Brief Mailed 8/4/2006 submitted herewith is the corrected Appeal Brief.

The Commissioner is hereby authorized to charge any fees or credit any overpayment associated with the this communication to Deposit Account 09-1990. If any unresolved issues remain please contact applicant's attorney at the telephone number listed below.

## I. Real Party In Interest

The real party in interest is International Business Machines (IBM) Corporation.

## II. Related Appeals and Interferences

Appellants or Appellant's legal representative or assignee has no personal knowledge of other appeals or interferences which will directly affect or be directly affected by or have a bearing on the decision of the Board in the pending appeal.

## III. Status of Claims

Claims 1-4, 6-23, and 26-34 are on appeal.

The application, as originally filed, contains Claims 1-25. Claims 26 through 34 were added by amendment. Claims 5, 24, and 25 were cancelled. Clams 17-18 and 20 are objected to.[1]

## IV. Status of Amendment

Subsequent to the final rejection, no amendment has been filed.

## V. Summary of Claimed Subject Matter

The present invention provides a memory structure and method of searching, with a network processor, information stored in the memory structure to determine action to be taken relative to a packet. The data structure and search method reduce latency associated with searching a database. Appellants' specification, page 2, lines 16-19.

---

[1]Objection based upon Examiner's allegation that Claim 17-18 and 20 contain "and/or". The word "and/or" is not present in any one of these claims. So it appears the Examiner is in error.

Claim 1 recites: using N bits from a packet as an index into a data structure including a Direct Table with at least one entry and a tree structure coupled to the one entry; page 10, lines 20-21; page 11, lines 1-11; and Figs. 4 and 4A, setting a threshold based upon a fixed number of nodes to be traversed in the tree structure; page 10, lines 8-19 and figs. 4-13. It should be noted PSCB (Pattern Search Control Block) is synonymous with node, page 10, line 1, using selected bits from the packet to traverse said tree structure until the threshold is met; page 10, lines 20-21; page 11, lines 1-3; page 11, lines 15-21; page 12, lines 14-19; and Fig. 4; storing in a CAM at least one entry based upon a predetermined characteristic of the packet and a second predetermined characteristic of said tree structure; page 12, lines 4-14 and Fig. 14; reading the CAM; page 12, line 13; using information at the at least one entry to access a memory location whereat action to be taken relative to the packet is stored; page 3, lines 9-12, page 10, lines 8-14, page 12, lines 4-14.

Claim 8, a method, calls for: using N bits from the search key as an index into the database having a Direct Table.....and at least one tree structure; page 10, lines 20-21; page 11, lines 1-2; Figs. 4 and 4A; setting a threshold based upon a fixed predetermined number of nodes to be traversed in the tree structure; page 10, lines 8-19; Figs. 4-13; using M bits from the search key to traverse said tree structure until the threshold is met; page 3, lines 9-12; page 10, lines 10-11; page 11, lines 1-7; page 13, lines 1-14; reading from the CAM information that indicates action to be taken relative to the search key; page 10, lines 1-13; page 12, lines 11-14.

Claim 10 calls for: "the information including the address of the leaf in which the information is stored"; page 10, lines 8-15.

Claim 11 recites using N bits as index into the CAM; page 12, lines 11-14.

Claim 12 recites: an embedded processor complex including plurality of protocol processors; page 6, lines 7-8; page 8, line 1; Fig. 1, 12; and Fig. 2, 40; a control point processor operatively coupled to the processor complex; page 6, lines 17-20; Fig. 1, 34; page 7, line 5; a plurality of hardware accelerator co-processors accessible to each protocol processor and providing high speed pattern searching, data manipulation and

frame parsing; page 7, lines 9-11; at least one memory device, operatively coupled to the processor complex, that stores data structures including a Direct Table, nodes and leaves operatively chained together; page 6, lines 15-16; page 16, lines 8-11; Fig. 15, 30; and a Memory location operatively coupled to the processor complex and storing a value representative of the maximum number of nodes to be accessed during a tree search routine; Col. 10, lines 8-12.

Claim 13 recites: a Contents Address Memory (CAM) operatively coupled to the processor complex and storing a pointer identifying a location whereat a leaf is stored; page 10, lines 10-15; page 16, line 6.

Claim 15 recites: wherein the CAM further includes an indicia paired with the pointer, said indicia being selected from a portion of the packet; page 12, line 8-11, Figs. 4A and 14.

Claim 16 calls for the indicia includes a portion of a Destination MAC Address in the packet; page 12, lines 11-13.

Claim 19 calls for: the Control Processor being programmed to generate and forward frames containing information that adjusts the data structure; page 14, lines 13-20.

Claim 21 recites: a Direct Table having at least two entries; page 9, lines 20-21; a tree structure operatively coupled to each one of the at least two entries and having a plurality of nodes and leaves operatively chained together; page 10, lines 1-5; and a storage storing a threshold value indicating a fixed predefined number of nodes to be accessed during a walk of said tree structure; page 10, lines 8-12.

Claim 22 recites: Contents Address Memory, CAM, in which leaf information is stored if the leaf is connected to a node whose count is above the threshold value; page 12, lines 19-21; page 13, lines 1-5.

Claim 23 calls for: a co-processor using part of a destination address (DA); in a packet to index into a direct table and remaining part of said DA address to search associated tree (page 11, lines 4-10 and lines 14-20) said pico processor selecting information stored in a leaf, if the leaf is attached to a node whose count is below the

threshold value (page 12, lines 14-17; Fig. 4) or selecting information stored in the CAM if the leaf is attached to a node above the threshold value (page 12, lines 17-21; page 13, lines 1-5; page 10, lines 8-13).

Claim 28 recites: providing a data structure configured as a tree having N nodes, N>1, and M leaves, M>1, operatively coupled to the N nodes; page 9, lines 19-20; page 10, lines 1-5; generating with a first processor a key from a packet; page 16, line 12, Fig. 15, 72; setting a threshold having a value equal to a fixed predefined number of the N nodes to be traversed; page 10, line 1and lines 8-13; providing in a CAM at least one entry with information relating to the key and information relating to the data structure; page 12, lines 4-14, Fig. 14; selecting, with a second processor, bits from the key and traversing the tree based upon the bits until threshold is met; page 16, line 8 and lines 15-17; reading at least one entry in the CAM to detect a location whereat action to be taken relative to the packet is stored; page 10, lines 10-19; page 3, lines 9-12.

Claim 29 calls for Direct Table (DT) having at least one entry operatively coupled to said tree; page 9, lines 18-21; Fig. 4, DT.

Claim 32 calls for tree walk and CAM search being executed sequentially; page 3, lines 9-12; page 10, lines 8-13.

Claim 34 calls for traverse of tree structure and CAM read are performed sequentially; page 3, lines 9-12; page 10, lines 8-13.

Claim 31 recites wherein the information relating to the data structure includes an address where at least one of the N leaves is stored; page 10, lines 12-14.

Claim 17 support is set forth at page 12, lines 4-7; page 14, item F.

Claim 2 support set forth at page 11, lines 5-7.

Claim 3 support set forth at page 3, lines 1-2.

Claim 3 support set forth at page 10, lines 2-3.

Claim 4 support set forth at page 10, lines 2-3.

Claim 6 support set forth at page 11, lines 8-10.

Claim 7 support set forth at page 12, lines 5-12.

## VI. Grouping of Rejection To Be Reviewed on Appeal

A. Whether the specification provides sufficient support to render Claims 32 and 34 patentable under 35 U.S.C. 112, first paragraph.

B. Whether Claims 1, 8-15, 17-23, 26-31, and 33 are patentable, under 35 USC 103(a), over Gupta et al. (U.S. Patent No. 6,691,124) further in view of Spinney (U.S. Patent No. 5,417,704).

C. Whether Claims 2-4, 6-7, and 16 are patentable, under 35 USC 103(a), over Gupta (U.S. Patent No. 6,691,124) in view of Spinney (U.S. Patent No. 5,417,04) and further in view of Weaver (U.S. Patent No. 6,173,384).

## V. Arguments

Arguments set forth herein to traverse the rejections set forth in VI are identified with like alphabetical characters.

### A. Rejection of Claims 23 and 34

Claims 32 and 34 are rejected under 35 USC 112, first paragraph. The basis for the rejection is that the claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors at the time of the application was filed had possession of the invention.

#### A1. Appellants' Specification Meets Written Description Required Under 35 USC 112, First Paragraph

Claim 32 calls for tree walk and CAM search are being executed sequentially. Likewise, Claim 34 calls for travers of the tree structure and CAM read are performed sequentially.

35 USC 112, first paragraph, in part, states; "The specification shall contain a written description of the invention,... in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains to make and use the same,..."

It is Appellant's contention the specification comports with the written description requirements set forth under 35 USC 112, first paragraph. Attention is directed to page 10, lines 8-13 of appellant's specification which states:

> Still referring to Figure 4, a CAM copy threshold is associated with each tree structure. The CAM copy threshold (depicted as a vertical line) is a number which is stored in the system and indicates the maximum number of PSCBs that can be traversed to reach a leaf. Once the number of nodes traversed exceeds the CAM copy threshold value the correlating mechanism (coprocessor or hardware) accesses the CAM to get information related to the leaf. Usually the address for the leaf is stored in the CAM rather than the information that is in the leaf.

The operative word is "Once". In this context it is used as a conjunction meaning - as soon as possible - (The American Heritage Dictionary of English Language). Simply put the passage means as soon as the number of nodes traversed exceeds the CAM Copy thresholds (a number) the correlating mechanism access the CAM....The process of traversing the nodes followed by accessing the CAM is sequential teaching which supports the language in Claims 32 and 34. With respect to Claim 32 "tree walk" (stated in Claim 32) is synonymous to "traversing nodes in the tree". See Appellants' specification, page 3, lines 7-8; page 11, lines 2-3.

In addition, in other teachings in Appellants' specification supporting "tree walk and CAM search being executed simultaneously" (Claim 32) and "traverse of tree structure and CAM read are performed sequentially" are set forth in the Abstract, to wit: "The number of nodes, termed threshold, that can be traversed to obtain information in the leaves is limited to a predetermined value. Once the threshold is reached, a pointer indicates the address of the CAM...." Summary of the Invention, page 3, lines 9-12; and the overall teaching of the invention as set forth in the specification as a whole.

With respect to page 3, lines 9-12, the operative word is "Thereafter", meaning "from then on". In other words, "tree walk" or "traverse" a set number of nodes followed by access to the CAM. This is sequential teaching supporting Claims 32 and 34.

The level of teaching, under 35 USC 112, first paragraph, is to enable one skilled in the art....and not for the unskilled. It is Appellants' contention the areas of

Appellants' specification identified above and the general teaching of the invention as described in the specification require the traverse of a fixed number of nodes in the tree followed by access to the CAM. This teaching is sufficient to enable one skilled in the art to practice the invention. As a consequent, Claims 32 and 34 are patentable under 35 USC 112, first paragraph.

## B. Rejection of Claims 1, 8-15, 17-23, 26-31, and 33

Claims 1, 8-15, 17-23, 26-31, and 33 are rejected under 35 USC 103(a) as being unpatentable over Gupta et al. (U.S. Patent No.6,691,124) in view of Spinney (U.S. Patent No. 5,417,704).

### B1. The Law As Applied to Rejection Under 35 USC 103(a) (Obviousness)

In order to sustain a rejection under 35 USC 103(a), a prima facie case of obviousness has to be established. To do so, the prior art references when combined must teach or suggest all the limitations in the rejected claim and there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references or to combine reference teachings. MPEP 2142.

As will be demonstrated hereinafter, none of these criteria is met. Therefore, a prima facie case of obviousness has not been established and the claims are not obvious in view of the references.

### B2. Rejection of Claim 1; Claim Limitations Not Found in References

Claim1, in part, recites "(b) setting a threshold based upon a fixed number of nodes to be traversed in the tree structure; (c) using selected bits from the packet to traverse said tree structure until the threshold is met".

U.S. Patent 6,691,124 (Gupta) discloses a data structure diagram of a hybrid tree structure including search nodes (Figure 1). A data look-up method for the tree

structure is shown in Figure 3 and described at Col. 5, lines 41-67 and Col. 6, lines 1-45. The patent teaches the look-up continues until the look-up search key is exhausted and there are no further bits for look-up or there are no further nodes below the node being looked at. Col. 6, lines 16-22.

This teaching suggests searching in a branch continues until all nodes are traversed. In this case, there is no need to set a threshold based upon number of nodes to traverse a is required by Claim 1.

It is Appellants' contention (b) and (c) singularly or in combination is not found in Gupta (U.S. Patent No. 6,691,124) or Spinney (U.S. Patent 5,414,704). As a consequence, even after the Examiner's combination, the resulting reference would not disclose limitations (b) or (c). Therefore, as set forth in B1, a prima facie case of obviousness has not been established and Claim 1 is patentable over the references.

In addition, Claim 1 recites: "(d) storing in a Contents Address Memory (CAM) at least one entry based upon a predetermined characteristic of the packet and a second predetermined characteristic of said tree structure:.

Even though the Examiner admits Gupta does not teach this element of Claim 1, he relied on Spinney for teaching it. Final Office Action, page 4, mailed 9/13/2005. In particular, the Examiner relied on Spinney's Abstract column 2, line 8-10 and Column 26, lines 5-58 as teaching this element of Appellants' claim 1.

Appellants have reviewed the Spinney reference, including the sections relied on by the Examiner and have concluded that no reasonable construction of Spinney would support a position that "suggests this element of Appellants' claim 1. CAM 23 in Spinney stores addresses which can be compared with addresses in a packet. If a match occurs, it can be used to find the frame control, destination address, source address DSAP, and SAP fields of bridge and relay link packets. Spinney, Col. 14, lines 48-64. All of these are "frame or packet characteristics: and none are characteristics of the tree structure" as required in claim 1. As a consequence, the limitation of claim 1, to wit "characteristic of the tree structure "is not disclosed in the Examiner's combination. Therefore, a prima facie case of obviousness has not been established.

With respect to claim 1, limitations (b) and (c) set forth above, Appellant is aware of the Examiner's contention that Gupta does teach these limitations. Appellants respectfully disagree and argue no such teachings are found in Gupta. For example, the Examiner relied on Gupta, Col. 6, lines 63-67, Col. 7, lines 1-5, and Col. 9, lines 2-11 for teaching "setting a threshold based upon the fixed number of nodes to be traversed in the tree structure (claim 1).[3] It is Appellants' contention these teachings from Gupta are two nebulous and unclear to be construed as suggesting this limitation in Appellants' claim 1. In fact, the language at Gupta, Col. 6, lines 63-67 and Col. 7, lines 1-5 teaches "compare a count with a threshold". There is no teaching as to how the threshold is obtained. Moreover, this teaching in Gupta is different from "setting a threshold based upon the number of nodes to be traversed in the tree structure" (Appellants' claim 1). Therefore, this limitation of claim 1 is not found in Gupta.

**B3. References Lack Motivation To Modify or Combine**

Claim 1 calls for setting a threshold based upon the number of nodes to be traversed and using selected bits from the packet to traverse said tree structure until the threshold is met.

As set forth in B2 and incorporated herein by reference, Gupta's teachings suggest searching in a branch continues until all nodes are traversed. Since Gupta required searching all nodes whereas claim 1 required (b) and (c) set forth in B2, to meet the terms of claim 1. Gupta would have to be modified to suggest setting the threshold based upon a fixed number of nodes to be traversed and traversing the tree until the threshold is met. Such modification would effectively change the principle of operation on which Gupta is based. As a consequence, the teachings of the references are not sufficient to render the claims prima facie obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959).

---

[3]See Final Office Action, page 4, lines 1-3, mailed 9/13/2005.

**B4. Gupta "Teaches Away" from Claim 1**

As argued in B2 and B3 and incorporated herein by reference, Gupta's teachings suggest traversing a branch continues until all nodes are traversed. Gupta, Col. 6, lines 17-22. Based upon this teaching, Appellants contend there is no need to "set a threshold based upon number of nodes to be traversed" (Appellants' claim 1) since the processing in Gupta requires traversing all nodes in a branch. Appellants' contend traversing all nodes in a branch is a "teach away" from traversing a fixed number of nodes set forth in Appellants' claim 1. As a consequence an artisan viewing teachings in Gupta would be lead away from setting a threshold as recited in claim 1. This "teach away" is deemed as indicia of unobviousness.

**B5. Novel Method and Benefits Are Indicia of Unobviousness**

As argued in B1, B2, and B3 and incorporated herein by reference, the method of claim 1 includes limitations (b), (c), and (d) not found in Gupta and Spinney singularly or in combination. As a consequence the method or process of claim 1 is novel.

Benefits resulting from this novel method is set forth in Appellants' Specification at page 3, lines 17-21 and page 4, lines 1-6. The novel process and benefits are deemed to be indicia of unobviousness.

**B6. Rejection of Claim 7**

Claim 7 depends on claim 2 which depends on claim 1. Due to the dependency of claim 7 on claim 1, claim 7 is patentable for arguments set forth above relative to claim 1 and incorporated herein by reference.

In addition., claim 7 is separately patentable. Claim 7 states the second predetermined characteristic include leaves. When read in combination with claim 1, the second predetermined characteristics include leaves of the tree structure. As argued above, this limitation of appellants' invention is not suggested in the reference singularly or in combination. Because the action to be taken relative to a packet is

sorted in the leaves of the tree. Appellants' Specification, page 3, lines 1-14. The CAM is a high speed look-up mechanism. Therefore, placing leaf information in the CAM reduces the latency with which action to be taken relative to a packet is obtained. Appellants specification, Page 3, lines 17-20. The novel type of data arrangement (i.e., destination MAC address paired with leaves) in the CAM and benefit of reduced latency are indicators of unobviousness. As a consequence, claim 7 is patentable over the art of record.

### B7. Rejection of Claim 8

Claim 8, in part, recites "(b) setting a threshold based upon a fixed predefined number of nodes to be traversed in the tree structure; (c) using M bits (M>1) from the search key to traverse said tree structure until the threshold is met".

As argued relative to claim 1 above and incorporated herein by reference, these limitations are not found in the references. In particular, arguments set forth under B1 through B5 are equally applicable to claim 8 and are submitted to support the patentability of claim 8 over Gupta and Spinney references.

### B8. Rejection of Claim 10

Claim 10 depends on claim 8 and recites, in part, "...the information includes the address of a leaf in which the action is stored."

Claim 10 is patentable over art of record due to its dependency on claim 9 which depends on claim 8.

In addition, claim 10 is separately patentable. The limitation of storing address of a leaf in which the action [to be taken relative to a frame] is stored is not found or suggested in the combination of Gupta and Spinney. So as argued above and incorporated herein by reference a prima facie case of obviousness has not been established. Therefore, claim 10 is patentable over the references.

Furthermore, the limitation recited above is not found in the references. Therefore, the method of claim 10 is novel. In addition, storing the address of the leaf

in the CAM rather than storing the information in the leaf provides benefits in that space (a scarce commodity in the CAM) is conserved. Appellants' specification, page 10, lines 13-16. As argued above and incorporated herein by reference, novel method or process and benefits are indicia of non-obviousness. Therefore, claim 10 is patentable.

**B9. Rejection of Claim 12**

Claim 12, an apparatus, recites: "an embedded processor complex including a plurality of protocol processor; a control point processor..., a plurality of hardware accelerator co-processor...; a memory location operatively coupled to the processor complex and storing a value representative of the maximum number" of nodes to be accessed during a tree search routine.

It is Appellants' contention none of the recited elements are found in the combination of Gupta and Spinney. As argued above and incorporated herein by reference since at least one of the recited elements is not found in the combination of references, a prima facie case of obviousness has not been established and claim 12 is not obvious in view of the references.

In addition, since at least one of the recited elements is not found or suggested in the references, the apparatus set forth in claim 12 is novel. The apparatus is referred to as a Network Processor shown in Figures 1 and 2 and described at pages 6 through 9 of Appellants' specification. By storing a value equivalent to the maximum number of nodes to traverse during a search routine the apparatus can complete a search in a shorter time than was possible by prior art techniques (Gupta, et al.) Of traversing all nodes in a branch. The shorter time to accomplish a search is beneficial to the user. As argued above and incorporated herein benefit and novel structure are indicia of unobviousness.

**Examiner's Contention**

With respect to claim 12, the Examiner contends each elements of the claim is found in the references. Comparison between elements of the claim and the references is set forth on page 8 through page 10 of the Final Office Action.

Appellants respectfully disagree with the Examiner and argue it seems as if the Examiner erred in the comparison and ultimate conclusion.

For example, to read Spinney on applicants' claim 12 the Examiner states Spinney teaches: "an embedded processor complex including a plurality of protocol processors (see col. 5, lines 45-49)". A review indicates Column 5, lines 45-49 merely teaches that the controller contains a processor or state machine 20. Certainly this teaching cannot reasonably be construed as an embedded processor complex including a plurality of protocol processors as it is claimed in Appellants' claim 12. In addition, the Examiner relies on the same part of the specification for support of "a control point processor...." as claimed in claim 12. As a consequence, the Examiner would be relying on the same element of the prior art to cover two separate and independent elements of Appellants' claim. It is clear from this that the structure set forth in Appellants' claim 12 is not present in the Examiner's references. Therefore, even after the Examiner's combination the missing elements would still be absent. As a consequence, claim 12 is not rendered obvious by the Examiner's combined references since the combined references failed to suggest or teach limitations, set forth above, of claim 12.

Still another example of the Examiner's error is the assertion that Gupta teaches a data structure including a Direct Table, nodes and leaves operatively chained together. The Examiner refers to Abstract and Col. 2, lines 4-10 of Gupta for teaching this claimed feature. See page 8, first paragraph, Final Office Action.

A review of the Gupta reference, including sections identified in the final Office Action, did not find any teachings of a "direct table" as set forth in the claim. The Gupta reference does teach a hybrid tree structure with nodes and leaves, but no direct table

as required by the claim. As a consequence, this element of Appellants' claim 12 is not found in the references.

**B10. Rejection of Claim 13**

Claim 13 depends on claim 12 and is patentable over the art of record for reasons set forth under B9 and incorporated herein by reference

In addition, claim 13 is separately patentable. Claim 13 calls for a CAM and storing a pointer identifying a location whereat a leaf is stored. As argued above in B8 and incorporated herein by reference storing the address of the leaf in a CAM reduce the latency in which the device called a Network Processor obtain stored information relative to a packet. The reduction in latency is a benefit. In addition, the device is novel since at least one of the recited elements is not found in the combined references. The novel structure coupled with benefit are indicia of unobviousness. Therefore, claim 13 is patentable over the art of record.

**B11. Rejection of Claim 17**

Claim 17 is patentable over the art of record as a result of its ultimate dependency on claim 12.

In addition, claim 17 is separately patentable. Claim 17 calls for a circuit that delete pointers from the CAM based upon leaf adjustment in the tree structure. When a leaf is added or deleted due to its attachment of a node above or below the threshold. A pointer in the CAM may not be necessary if the leaf is above the threshold. Therefore, deleting the pointer from the CAM creates more space in the CAM. As argued above, space in the CAM is at a premium. Therefore, deleting the pointer to create more space is a benefit. The recited feature of claim 17 is not found in the references. Therefore, the structure of claim 17 is novel. As argued above and incorporated herein by reference, novel structure and benefits are indicia of unobviousness.

With respect to claim 17, the Examiner asserts modified Gupta et al., teaches this feature where "insertion or a node removal" are read on "leaf adjustments". See page 10, last paragraph of Final Office Action.

Appellants contend equating "insertion or a removal of a node" with leaf adjustment as set forth in claim 17 is improper; since nodes and leaves are different component of a tree and adjustment to one does not necessarily affect the other. In addition, "insertion or deletion" in Gupta was not done relative to a CAM. Therefore, the teachings of nodes in Gupta would not suggest the deletion of pointers in the CAM based upon leaf adjustment as set forth in claim 17.

### B12. Rejection of Claim 19

Claim 19 is patentable over Gupta and Spinney references due to its dependency on claim 12. The arguments set forth above to support patentability of claim 12 is equally applicable and is incorporated herein by reference.

In addition, claim 19 is separately patentable. Claim 19 calls for the control processor to be programmed to generate and forward frames containing information that adjust the data structure. This feature is not found in the combined references. Because the combined references lack this limitation, a prima facie case of obviousness as not been established.

In addition, lack of this limitation in the references indicate a novel structure. By allowing the control processor to generate and forward frames that adjust the data structure, the other components (such as the embedded processor complex, hardware accelerator co-processor, etc.) can be performing other tasks, some of which could be simultaneous. This division of tasks further improves system throughput, a benefit. As argued above and incorporated herein by reference, novel structure and benefit are indicia of unobviousness.

With respect to claim 19, the Examiner points to sections of Gupta et al. and Spinney, as allegedly teaching the novel element set forth in claim 19. See page 11, second paragraph, Final Office Action.

Based upon a review of both references, including the sections identified in the Final Office Action, Appellants assert these teachings in the references are too nebulous and unclear to justify a finding of teaching or even suggesting the claimed limitation. As a consequence, the argument that the references suggest the claimed limitation should be rejected out of hand.

**B13. Rejection of Claim 28**

Claim 28 calls for, among other things, setting a threshold having a value equal to a fixed predefined number of the N nodes to be traversed; providing in a CAM at least one entry with information relating to the key and information relating to the data structure; selecting, with a second processor, bits from the key and traversing the tree based upon the bits until the threshold is met.

As argued above and incorporated hereby by reference, Appellants contend that none of the recited elements are found in the combined references. Therefore, a prima facie case of obviousness has not been established. So claim 28 is not obvious.

In addition, populating the CAM with information relating to the key which relates to the packet and information relating to the data structure enables the method to obtain stored information relative to a packet in a much shorter period of time. In other words, latency associated with such look-up is reduced. The latency improvement is a benefit to users. Because at least one of the recited elements is not found in the references, the method is novel. The novel method and benefits are indicia of unobviousness.

The Examiner's remarks on each of theses elements and support in the respective ones of the references mirror previous arguments made by the Examiner regarding the elements. These arguments have been adequately addressed. See, for example, discussion under B2 and B8 above. .

It is believed further response to these remarks would only be repetitive. Therefore, Appellants elect to stand on previously made arguments in this regard.

**B14. Rejection of Claim 31**

Claim 31 is patentable over the references due to its ultimate dependency on claim 28. The argument set forth above relative to claim 28 is equally applicable and incorporated herein by reference.

In addition, claim 31 is separately patentable. Claim 31 calls for information relating to data structure including an address whereat at least one of the N leaves is stored. This feature makes the method novel and improves latency associated with information retrieved. The supporting argument is set forth under B6 and incorporated herein by reference. The novel structure and benefit are indicia of unobviousness. Therefore, claim 31 is not obvious.

### C. Rejection of Claims 2-4, 6-7, and 16

Claims 2-4, 6-7, and 16 are rejected under 35 USC 103(a) as being unpatentable over U.S. Patent No. 6,691,124 (Gupta et al.) In view of U.S. Patent No. 5,417,704 (Spinney) as applied to claims 1, 8-15, 17-23, 26-31, and 33 above, and further in view of U.S. Patent No. 6,173,384 (Weaver).

### C1. Rejection of Claims 2, 3, and 4

Claims 2, 3, and 4 depend on claim 1. Due to this dependency, all limitations and arguments set forth above relative to claim 1 are equally applicable and incorporated herein by reference. The deficiencies found in Gupta and Spinney are not taught in Weaver. Therefore, Weaver does not make claims 2, 3, and 4 unpatentable.

In addition, claim 2 is separately patentable. Claim 2 calls for the first 16 bits of the Destination Address to be used as an index into the data structure. This limitation is also implied in Claims 3 and 4 due to dependency on claim 2.

It is Appellants' contention Weaver does not teach this limitation. The Examiner cites Weaver for teaching the limitation and specific points to Weaver, Col. 4, lines 43-49, Col. 5, lines 25-32. See page 16, item 7, Final Office Action.

The columns and lines identified by the Examiner was reviewed and no teaching of the limitation relating to the first 16 bits of the MAC address was found. Therefore, it seems the Examiner erred. Therefore, even after the combination of Gupta, Spinney, and Weaver, this limitation would not have been taught. As a consequence even with the Weaver reference a prima facie case of obviousness has not been established. So claims 2, 3, and 4 are patentable and not obvious.

**C2. Rejection of Claim 6**

Claim 6 is patentable over the references due to its dependency on claim 1 and claim 2. The arguments set forth above supporting patentability of claims 1 and 2 over the cited references are equally applicable and incorporated herein by reference.

In addition, claim 6 is separately patentable. Claim 6 depends on claim 2 and calls for the remaining thirty-two bits of the Destination MAC address to be used to traverse said tree structure. No such limitation is found in Weaver. As a consequence, this limitation would not be found in the references of Gupta, Spinney, and Weaver. Absent this limitation in the combined references, a prima facie case of obviousness has not been established. Therefore, claim 6 is patentable over the references.

It seems the Examiner erred in stating that this limitation is taught in Weaver. Because a review of Weaver did not find such teachings. It should also be noted the Examiner is relying on the same part of Weaver (Col. 4, lines 43-49, Col. 5, lines 25-32) that was used to support the rejection of claim 2. This seems improper. Because claim 2 and claim 6 claim separate elements and the same feature in the reference should not be used as a basis to reject both claims.

**C3. Rejection of Claim 7**

Claim 7 due to its dependency on claims 1 and 2 is patentable over the references. The arguments set forth above regarding patentability of claims 1 and 2 are equally applicable and incorporated herein by reference. Likewise, the argument set forth under B6 is equally applicable and incorporated herein by reference.

**C4. Rejection of Claim 15**

Claim 15 is patentable due to its ultimate dependency on claims 13 and 12. The arguments set forth above relative to the patentability of claims 12 and 13 are equally applicable and incorporated herein by reference.

In addition, claim 15 calls for: the CAM further includes an indicia paired with the pointer, said indicia being selected from a portion of the packet. It is Appellants' contention this limitation is not found in Gupta or Spinney. The Examiner points to Spinney, Col. 16, lines 20-25, as teaching the limitation of Appellants' claim 15. (See page 10, second to last paragraph, Final Office Action.) Spinney reference, including portions relied on by the Examiner, was reviewed and the limitation could not be found. Therefore, as argued above and incorporated by reference. A prima facie case of obviousness has not been made. Therefore, claim 15 is not obvious in view of the references.

**C5. Rejection of Claim 16**

Claim 16 depends on claims 15, 13, and 12. Because of this dependency, claim 16 is patentable for arguments set forth above. Those arguments are incorporated herein by reference.

In addition, claim 16 is separately patentable. Claim 16 recites wherein the indicia includes a portion of a Destination Address in the packet. This limitation is not found in Weaver as the Examiner seems to suggest. In particular, the Examiner relies on Weaver, col. 4, lines 43-49 and col. 5, lines 25-32. A review of these sections indicates Weaver appears to use the entire Destination Address to perform a different function rather than a portion of Destination Address to perform the function set forth in claim 16. As a consequence, this limitation of Appellants' claim 16 is not found in the references. As argued above and incorporated herein by reference, a prima facie case of obviousness has not been established and claim 16 is not obvious.

## CONCLUSION

Based upon the above arguments, claims 1-4, 6-23, and 26-34 (appealed claims) define patentable subject matter and are not obvious in view of the cited references or lack support in the specification. As a consequence, the final rejection of these claims should be reversed.

Note: For convenience of detachment without disturbing the integrity of the remainder of pages of this Appeal Brief, Appellants' "Appendix" section is provided on separate sheets following the signatory portion of this Appeal Brief.

Respectfully submitted,

By Joscelyn G. Cockburn
Joscelyn G. Cockburn,
Attorney of Record
Reg. No. 27069

Customer Number 25299
IBM Corporation
Intellectual Property Law YXSA/B002
PO Box 12195
Research Triangle Park, NC 27709
Telephone: 919-543-9036
Fax: 919-254-2649

## Claims Appendix

1. A search method comprising the acts of:

   - using N bits, N being an integer, from a packet as an index into a data structure including a Direct Table with at least one entry and a tree structure operatively coupled to said one entry;
   - setting a threshold based upon a fixed number of nodes to be traversed in the tree structure;
   - using select bits from the packet to traverse said tree structure until the threshold is met;
   - storing in a Contents Address Memory (CAM) at least one entry based upon a predetermined characteristic of the packet and a second predetermined characteristic of said tree structure;
   - reading the CAM; and

   (e1) using information at the at least one entry to access a memory location whereat action to be taken relative to the packet is stored.

2. The method of Claim 1 wherein N includes the first sixteen bits of a Destination MAC Address.

3. The method of claim 2 wherein the tree structure includes a plurality of nodes and leaves operatively coupled to selected nodes.

4. The method of claim 3 further including Pattern Search Control Blocks (PSCBs) carrying search information positioned at selected nodes.

6. The method of Claim 2 wherein the selected bits include the remaining thirty two bits of the Destination MAC Address.

7. The method of Claim 2 wherein the second predetermined characteristic includes leaves.

8. A method for correlating a search key with a database comprising the acts of:

(a) using N bits, N > 1, from the search key as an index into the database including entries having a Direct Table with at least one entry and [[a]] at least one tree structure operatively coupled to said one entry;

(b) setting a threshold based upon a fixed predefined number of nodes to be traversed in the tree structure;

(c) using M bits (M > 1) from the search key to traverse said tree structure until the threshold is met; and

(d) reading from a CAM information that indicates action to be taken relative to the search key.

9. The method of claim 8 wherein the search key includes a portion of a data packet.

10. The method of claim 9 wherein the information includes the address of a leaf in which the action is stored.

11. The method of claim 8 wherein the reading step further includes the step of using the N bits as index into the CAM.

12. An apparatus comprising:

an embedded processor complex including a plurality of protocol processors;

a control point processor operatively coupled to the processor complex;

a plurality of hardware accelerator co-processors accessible to each protocol processor and providing high speed pattern searching, data manipulation and frame parsing;

at least one memory device, operatively coupled to the processor complex, that stores data structures including a Direct Table, nodes and leaves operatively chained together; and

a Memory location operatively coupled to the processor complex and storing a value representative of the maximum number of nodes to be accessed during a tree search routine.

13. The apparatus of claim 12 further including a Contents Address Memory (CAM) operatively coupled to the processor complex and storing a pointer identifying a location whereat a leaf is stored.

14. The apparatus of claim 13 wherein the leaf contains information on actions to be taken relative to a packet.

15. The apparatus of claim 14 wherein the CAM further includes an indicia paired with the pointer, said indicia being selected from a portion of the packet.

16. The apparatus of Claim 15 wherein the indicia includes a portion of a Destination MAC Address in the packet.

17. The apparatus of Claim 15 further including a circuit that deletes pointers from the CAM based upon leaf adjustment in the tree structure.

18. The apparatus of Claim 17 wherein the leaf adjustments include deletion.

19. The apparatus of Claim 12 wherein the Control Point Processor is programmed to generate and forward frames containing information that adjusts the data structure.

20. The apparatus of Claim 19 wherein the adjustment includes leaf deletion or insertion.

21. A data structure comprising:

a Direct Table having at least two entries;

a tree structure operatively coupled to each one of the at least two entries and having a plurality of nodes and leaves operatively chained together; and

a storage storing a threshold value indicating a fixed predefined number of nodes to be accessed during a walk of said tree structure.

22. The data structure of Claim 21 further including Contents Address Memory, CAM, in which leaf information is stored if the leaf is connected to a node whose count is above the threshold value.

23. The data structure of Claim 22 further including a co-processor responsive to at least a command to use part of the DA (Destination Address) of a packet to index into the DT (Direct Table) and the remaining part of said DA to search the associated tree, said co-processor selecting, information stored in a leaf if the leaf is attached to a node whose count is below the threshold value or selecting information stored in the CAM if the leaf is attached to a node above the threshold value.

26. The apparatus of claim 15 further including a circuit that delete pointers from CAM based upon non-use of the information within a predefined time interval.

27. The method of claim 19 wherein the adjustment includes leaf insertion.

28. A method comprising:

providing a data structure configured as a tree having N nodes, N >1, and M leaves, M >1, operatively coupled to the N nodes;

generating with a first processor a key from a packet;

setting a threshold having a value equal to a fixed predefined number of the N nodes to be traversed;

providing in a CAM at least one entry with information relating to the key and information relating to the data structure;

selecting, with a second processor, bits from the key and traversing the tree based upon the bits until the threshold is met; and

reading at least one entry in the CAM to detect a location whereat action to be taken relative to the packet is stored.

29. The method of claim 28 further including providing a Direct Table (DT) having at least on entry operatively coupled to said tree.

30. The method of claims 28 or 29 wherein information relating to the key including a destination address in said packet.

31. The method of claims 28 or 29 wherein the information relating to the data structure includes an address where at least one of the N leaves is stored.

32. The method of claim 28 wherein the tree walk and CAM search are being executed sequentially.

33. The data structure of claim 22 further including a pointer provided in said storage, said pointer identifying address of said CAM.

34. The method of claim 1 or claim 8 wherein traverse of the tree structure and CAM read are performed sequentially.

## Related Proceedings Appendix

There are no related proceedings to this current appeal.

## Evidence Appendix

This page is left intentionally blank. There is no associated evidence related material filed with this brief.